APPLICATION FOR PATENT

5   Inventor: **Matthew Hertz**

Title: **Method and apparatus for addressing short messages to mobile devices that do not have valid telephone numbers.**

FIELD OF THE INVENTION

10   The present invention relates to methods for delivering text messages across wireless networks to mobile devices such as cellular telephones and pagers, and, more particularly, to methods for addressing text messages to mobile devices that do not have valid telephone numbers.

BACKGROUND OF THE INVENTION

15   Mobile text messages such as paging, short messaging service (SMS) messages and the like, all referred to herein as "SMS" messages, are text messages sent from or to mobile devices such as mobile phones pagers, personal digital assistance (PDA) devices, etc. SMS is a major source of revenue for wireless operators, and the fastest growing service in the wireless industry. Worldwide, more

20   than one billion SMS messages are sent daily, generating significant revenues for operators.

         Systems that transmit messages between wireless devices or networks are known. Such a system is generally referred to as Short Messaging Service Center (SMSC) or SMSC-Gateway and provided by companies such as LogicaCMG

25   (Stephenson House, 75 Hampstead Road   London, NW1 2PL, UK). Such a system receives a message from an originating device or system, and, using a routing table, locates the intended recipient device and transmits the message to that device. If the recipient device is on a different network (i.e. if the recipient telephone number does not appear in the SMSC internal routing table), the system will transfer the message to

30   a "gateway" such as the SMSC-Gateway provided by LogicaCMG above. A gateway

is a system that transmits messages between different SMSCs. In addition to converting SMS messages between different formats, a gateway uses a routing table linking telephone numbers or number-ranges with their corresponding networks/SMSCs. The gateway receives the message, determines the recipient's

5   network, and then converts, reformats and sends the message to the appropriate recipient's network in the correct format.

The routing and addressing module in existing SMSCs is based on the subscriber's MDN (Mobile Directory Number) or the subscriber's MIN (Mobile Identification Number). The MDN is the telephone number used when calling the

10   mobile device, and the MIN is the internal identification number of the mobile device in a cellular network. In paging networks, an MIN is usually referred to as a PIN (Personal Identification Number). Being an internal identification numbers, a MIN does not adhere to the telephone numbering system rules, and is not unique outside its network. Thus, an MIN cannot be used in an addressing and routing system outside its

15   network. Some mobile devices have a valid associated MDN for addressing voice-calls and text-messages. However, many mobile devices have only a MIN, making it impossible to route inter-network messages addressed to them.

A valid telephone number is typically constructed from (i.e. comprises) an area code, a telephone exchange code and a subscriber code. For example, in North

20   America, telephone numbers are in the form NPA-NXX-XXXX, where NPA (Numbering Plan Area) is the term used for area code, NXX is the telephone exchange code, and XXXX stands for the 4 digits subscriber number. The operating network of any telephone number can be determined by looking-up a table of NPA, NXX and XXXX ranges. Such a table is shown in FIG. 5.

25   FIG. 1 shows a typical computer-based SMSC-Gateway system **100**, comprising a message receive function **102**, a route function **104**, a numbering database **108** and a transmit function **106**. When a new message arrives in system **100**, message receive function **102** accepts the message details (sender, recipient, content etc.) and transfers them to route function **104**. Route function **104** searches numbering

30   database **108** for the network of the recipient telephone number. If a network is found, function **104** sends the message using transmit function **106**. If a network is not found, function **104** sends an error message to the sender using transmit function **106**.

The steps in method of handling of a message in system **100** are additionally described in FIG. 2. The system receives in step **202** a message with the sender and recipient addresses. In step **204**, the system (through route function **104** above) searches for the recipient network in a routing table, such as table **500** in FIG. 5 below. If the recipient network is found, the message is sent in step **208**. If the network is not found, an error message is sent to the sender in step **210**.

In a typical system, numbering database **108** includes a universal routing table such as table **500**, FIG. 5, where each number is universally unique and assigned to a network; no two similar numbers can appear in this table, since a conflict is created if the table is pointing one number to two (or more) different networks. Accordingly, in the typical system, message routing function **104** either rejects messages addressed to non-valid telephone numbers (MINs) due to an unrecognized format (wrong number of digits) or, if the format is recognized (number of digits is similar to a telephone number), addresses each such message erroneously to a telephone number (MDN) similar to the MIN.

Methods for routing involving multiple SMSCs are known, and described for example in US patent No. 6,292,669 to Meuronen, et al., and in US patent No. 6,208,870 to Lorello et al. which are incorporated herein by reference. Such methods attend only to cases where a recipient address is a universally unique number, such as a telephone number, so that a universal routing table can be established. In these cases, searching through the table provides a clear means for routing each number to the recipient network. However, in cases where the recipient address is a MIN, which is not a universally unique number, this universal routing table cannot be used, as it creates a conflict if a similar number already appears in the table and is pointing to a different network.

There is therefore a need for, and it would be advantageous to have, a method and system for addressing short messages to mobile devices that do not have universally valid telephone numbers.

SUMMARY OF THE INVENTION

The present invention provides a system and method for addressing short messages to mobile devices without valid (or "non-valid") telephone numbers (i.e. mobile devices having a MIN). According to the present invention every network is assigned a prefix, very similar to an area code, which users will then dial before the MIN.

According to the present invention there is provided a method for addressing a message sent by a sender to a mobile device that does not have a valid telephone number, the method comprising the steps of receiving a prefixed MIN address that includes a two-part prefix attached to a non unique, intra-network mobile identification number, the prefixed MIN address uniquely defining the mobile device, and routing the message to the mobile device using the prefixed MIN address.

According to one feature in the method for addressing a message sent by a sender to a mobile device that does not have a valid telephone number, the two-part prefix includes as a first part a MIN identifier, and as a second part a network identifier.

According to another feature in the method for addressing a message sent by a sender to a mobile device that does not have a valid telephone number, the step of routing includes searching a database for a destination network identified by the network identifier, and removing the prefix from the prefixed MIN address, thereby leaving a recipient address comprising only the MIN.

According to the present invention there is provided a method for routing a message having a recipient address to a mobile device that does not have a valid telephone number, the method comprising the steps of checking the recipient address, and based on the checking, uniquely identifying the recipient address with the mobile device.

According to one feature in the method for routing a message having a recipient address to a mobile device that does not have a valid telephone number, the recipient address includes a two-part prefix comprising a MIN identifier and a network identifier, the address further comprising a MIN.

According to another feature in the method for routing a message having a recipient address to a mobile device that does not have a valid telephone number, the identifying further includes identifying a destination network from the network identifier.

5   According to the present invention the method for routing a message having a recipient address to a mobile device that does not have a valid telephone number further comprises removing the prefix and sending the message to the mobile device identified by the MIN on the destination network.

According to the present invention there is provided a system for routing SMS

10   messages to mobile devices that do not have valid telephone numbers comprising: a receive message function operative to receive a message having a recipient address that includes a prefix attached to a second section of a number; a routing message function operative to identify a recipient based on the recipient address, the routing function further operative to remove the prefix; and a send message function for

15   sending the message to the mobile device.

According to one feature in the system for routing SMS messages to mobile devices that do not have valid telephone numbers according to the present invention, the prefix includes a MIN identifier that indicates that the second section of the number is a MIN, the prefix further including a network identifier identifying a

20   destination network of the mobile device.

According to the present invention there is provided a system for routing SMS messages to mobile devices comprising; a receive message function operative to receive a message having a recipient address; a routing message function operative to decide, based on the recipient address, if the recipient address has a valid or non-valid

25   telephone number; and means to send the message to the recipient address.

According to one feature in the system for routing SMS messages to mobile devices according to the present invention, the recipient address is a number comprising a prefix + second section, the prefix indicating that the recipient address is a non-valid telephone number.

30   According to another feature in the system for routing SMS messages to mobile devices according to the present invention, the prefix includes as a first part a MIN identifier that identifies the second section as a MIN, and as a second part a network identifier that identifies a destination network associated with the MIN, the network identifier stored in a network identifiers database.

According to yet another feature in the system for routing SMS messages to mobile devices according to the present invention, the routing function is further operative to remove the prefix and leave the second section as an address identifying the mobile device.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings. In the drawings, like reference numbers indicate identical or

10   functionally similar elements.

FIG. 1 shows a basic configuration of an existing message transmission system;

FIG. 2 is a flowchart showing the process of the message routing function in the system of FIG. 1;

15   FIG. 3 shows a basic configuration of a message transmission system according to the present invention;

FIG. 4 is a flowchart showing the process of the message routing function according to the present invention;

FIG. 5 shows an exemplary table in a routing database of valid telephone

20   numbers;

FIG. 6 shows an exemplary table in a routing database of network identifiers (BBB) for non-valid telephone numbers according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides a system and method for addressing short

25   messages to mobile devices without valid telephone numbers, whereby every network is assigned a two-part prefix, very similar to an area code, which users will then dial before the (PIN) MIN. The system recognizes the prefix, and routes the message using a special "prefix table"; after identification of the recipient network, the prefix is

removed from the MIN, and the message is transmitted with the original MIN to the identified network.

FIG. 3 shows a modified SMSC-Gateway system **300** according to the present invention. System **300** differs from prior art systems such as system **100** of FIG. 1 in that it comprises a modified route message function **304** (instead of function **104**) and an added network identifiers database **310**. When a new message arrives in system **300**, message receive function **302** accepts the message details (sender, recipient, content, etc.) and transfers them to modified route function **304**. Modified route function **304** first checks if a recipient address in the message is a valid telephone number, which is searched the accepted way in a numbering database **308**, or whether the recipient address is a MIN (i.e. "non-valid telephone number") as part of a prefix + MIN number. If the latter, the prefix is searched in network identifiers database **310**, after which the prefix is removed from the address. A prefix + MIN number in the present invention is also referred to as a "prefixed MIN address". Either way, whether the recipient address is a valid telephone number or a prefixed MIN address, if a network is found, modified route message function **304** sends the message using transmit function **306**, and if the network is not found, function **304** sends an error message to the sender using transmit function **306**. A prefix in the system and method of the present invention may be any number, of any predetermined length. However, in order to simplify the description, the example given below uses a 6 digits number. The first three digits (first part) in the prefix, referred to as "MIN identifier" or AAA, are used to determine that the recipient address is not a valid telephone number, and thus must be routed differently than a valid telephone number. The next three digits (i.e. second part), referred to as the "network identifier" or BBB, are used to determine the network to which the MIN belongs.

As a MIN identifier, the AAA by its nature cannot be similar to any prefix of a valid telephone number such as country code or an area code. Therefore, it must be a number that according to the International Telecommunication Union (ITU) recommendation E.164, which is incorporated herein by reference, cannot be and cannot begin with a country-code of a valid telephone number, and according to the NANPA (North America Number Plan Authority) cannot be a valid area code. Examples for admissible AAA numbers include 211 and 999, but any number that

fulfills the conditions above will be acceptable. The network identifier BBB in this example is a 3-digit code that is assigned to each network using MINs. For example, a network A will be assigned a network identifier 200, a network B will be assigned a network identifier 201, and so on. Thus, in order to send a message to a subscriber

5   with a 12345 MIN on network A, a sender will address the message to the number 100 200 12345 (AAA BBB MIN).

In use, in contrast with methods used in prior art systems, a message routed by routing message function **304** undergoes the additional steps of determining weather the recipient address is a valid telephone number or a prefixed MIN address, prior to

10   searching the applicable routing database (**308** or **310**), and prior to undergoing a treatment to remove the prefix from the original address if the address was a prefixed MIN address. The additional steps and the treatment of a prefixed MIN address to remove the prefix, which embody the essential features of the method of the present invention, and which involve exchange of information with databases, is performed

15   by the modified routing software **304**, as described in further detail in FIG. 4.

FIG. 4 describes a method of routing messages using a modified SMSC-Gateway system **300** according to the present invention. The system receives in step **402** a message with the sender and the recipient addresses. In step **406**, the recipient address is analyzed to check if the address starts with AAA. If it does ("Yes" - the first

20   3 digits are the predefined MIN identifier), i.e. if this is a prefixed MIN address, the system, in step **408**, searches for the recipient network in a network identifier table containing network identifiers BBB, as shown for example in a table **600** in FIG. 6. Then, in step **410**, the system removes the two-part AAABBB prefix from the original prefixed MIN address, so that the recipient network will only get the original MIN

25   digits (e.g. 12345), and will be able to recognize the recipient. Steps **408-410** reflect the special treatment or the essence of "addressing short messages to mobile devices without valid telephone numbers" mentioned above.

Returning to step **406**, if the recipient address is analyzed and the address is found not to start with AAA ("No"), the system assumes it is a valid telephone

30   number, and handles it accordingly, i.e. in step **412** the system searches for the recipient network within a telephone numbers routing table such as table **500** of FIG. 5. In either case (either "Yes" or "No" in step **406**), i.e. whether the recipient address

is a MIN or a valid telephone number, i the network is searched for in step **414,** and, if found, the message is sent to the network in step **416.** If the network is not found in step **414,** an error message is sent to the sender in step **418.**

An exemplary database system that may be used either for database **308** or database **310** (or both) is an RDBMS (Relational DataBase Management System). An example to an RDBMS is Oracle database (Oracle Corp., Redwood Shores, California). Computer systems incorporating RDBMS software using a Structured Query Language (SQL) interface are well known in the art.

In summary, the present invention provides an advantageous solution to the problem of messages addressed to mobile devices that do not have a valid telephone number. This is done by providing as an address a prefix+MIN number (also referred to as "prefix plus second section"), in which the prefix is preferably of type AAABBB, where AAA is a MIN identifier and BBB is a network identifier. The system recognizes from the AAA MIN identifier that the recipient address is a MIN, and from the BBB network identifier the network to which this MIN belongs. The system then removes the AAABBB prefix before sending the message to the recipient network. Note that the three-digit embodiment of both the MIN identifier (AAA) and network identifier (BBB) is exemplary only. As mentioned, the prefix can be of any arbitrary length, and other embodiments using a different number of digits are possible and in the scope of the present invention.

The system described above can be implemented in software or hardware, or a combination of software and hardware. When implemented primarily in hardware, it may use components such as Programmable Array Logic units (PALs), application specific integrated circuits (ASICs), or other hardware components. Implementation of a hardware state machine to perform the functions described herein will be apparent to persons skilled in the relevant arts.

All publications mentioned in this specification are herein incorporated in their entirety by reference into the specification, to the same extent as if each individual publication was specifically and individually indicated to be incorporated herein by reference. In addition, citation or identification of any reference in this application

shall not be construed as an admission that such reference is available as prior art to the present invention.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made. What has been described above is merely illustrative of the application of the principles of the present invention. Those skilled in the art can implement other arrangements and methods without departing from the spirit and scope of the present invention. The method of the invention can be implemented in software, which can be stored on computer disks or other computer-readable media, for execution in a host or target computer.